

DIRECT TESTIMONY AND EXHIBITS OF

BRANDON S. BICKLEY

ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO. 2020-3-E

IN RE: ANNUAL REVIEW OF BASE RATES FOR FUEL COSTS OF

DUKE ENERGY CAROLINAS, LLC, DECREASING RESIDENTIAL AND

NON-RESIDENTIAL RATES

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Brandon S. Bickley. My business address is 1401 Main Street, Suite 900, Columbia, South Carolina 29201. I am employed by the South Carolina Office of Regulatory Staff (“ORS”) in the Energy Operations Division as a Regulatory Analyst.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received my Bachelor of Science Degree with a major in Mechanical Engineering from the University of South Carolina in 2010. From 2010 to 2013, I was employed as a Nuclear Engineer, Reactor Fuel Safety Officer, and Shift Refueling Engineer at Norfolk Naval Shipyard. In that capacity, I performed engineering and operational duties in support of the United States Navy related to reactor servicing, reactor fuel, special nuclear material, special nuclear projects, security, and safety. From 2013 to 2017, I was employed as an Inspections, Tests, Analyses, and Acceptance Criteria (“ITAAC”) Engineer with South Carolina Electric & Gas Company (“SCE&G”). In that capacity, I obtained the level of a Senior Engineer and performed ITAAC reviews and construction oversight for SCE&G. From 2017 to 2019, I was employed by Savannah River Remediation as a Senior Engineer.

**THE OFFICE OF REGULATORY STAFF
1401 Main Street, Suite 900
Columbia, SC 29201**

1 In that capacity, I performed systems engineering duties in support of the Defense Waste
2 Processing Facility for Savannah River Remediation. I began my employment with ORS
3 as a Regulatory Analyst in July 2019.

4 **Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE**
5 **COMMISSION OF SOUTH CAROLINA (“COMMISSION”)?**

6 **A.** Yes. I have previously testified before the Commission.

7 **Q. WHAT IS THE MISSION OF ORS?**

8 **A.** ORS represents the public interest as defined by the South Carolina General
9 Assembly as:

10 [T]he concerns of the using and consuming public with respect to public
11 utility services, regardless of the class of customer, and preservation of
12 continued investment in and maintenance of utility facilities so as to provide
13 reliable and high-quality utility services.

14 **Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?**

15 **A.** The purpose of my direct testimony is to set forth ORS’s recommendations
16 resulting from ORS’s examination and review of Duke Energy Carolinas, LLC’s (“DEC”
17 or “Company”) power plant operations used in the generation of electricity to meet the
18 Company’s South Carolina retail customer requirements during the review period. The
19 review period includes the actual data for June 2019 through May 2020 (“Actual Period”),
20 estimated data for June 2020 through September 2020 (“Estimated Period”), and forecasted
21 data for October 2020 through September 2021 (“Forecasted Period”).

22 **Q. WAS THE REVIEW TO WHICH YOU TESTIFY PERFORMED BY YOU OR**
23 **UNDER YOUR SUPERVISION?**

24 **A.** Yes, the review to which I testify was performed by me or under my supervision.

Q. WHAT DID ORS'S REVIEW OF THE COMPANY'S PLANT OPERATIONS INVOLVE?

A. ORS examined various fuel and performance related documents as part of its review. These documents address the Company's electric generation and power plant outage and maintenance activities. In preparation for this proceeding, ORS analyzed the Company's monthly fuel reports including power plant performance data, unit outages, and generation statistics. ORS attended (via virtual participation) the May 18, 2020, Nuclear Regulatory Commission ("NRC") 2019 Annual Assessment meeting for the Catawba, McGuire, and Oconee Nuclear Stations.

Q. WHAT ADDITIONAL STEPS WERE TAKEN IN ORS'S REVIEW OF THE COMPANY'S FILING?

A. ORS met remotely with Company personnel from various departments to discuss and review the Company's electric generation, power plant outages, and maintenance activities. In addition, ORS monitored electric generation statistics through industry and governmental publications.

Q. DID ORS EXAMINE THE COMPANY'S PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. Yes. ORS reviewed the performance of the Company's generation units to determine if the Company made reasonable efforts to maximize unit availability and minimize fuel costs. ORS also reviewed the operating statistics of the Company's power plants by unit. Exhibit BSB-1 shows, in percentages, the average annual availability, net capacity, and forced outage factors of the Company's major generation units during the Actual Period. This Exhibit also includes the North American Electric Reliability

Corporation (“NERC”) national five-year (2014-2018) averages for availability, capacity, and forced outage factors for each type of generation plant.

Q. PLEASE EXPLAIN HOW THE OUTAGES ARE REPRESENTED ON EXHIBITS BSB-2 THROUGH BSB-4.

A. Exhibits BSB-2 and BSB-3 summarize outages lasting seven (7) or more days for major coal and natural gas units during the Actual Period, respectively. While not all plant outages were included in these exhibits, all outages were reviewed and found to be reasonable by ORS. Exhibit BSB-4 shows the duration, type, and cause for all outages at the Company’s nuclear units during the Actual Period. There were six (6) separate outages involving DEC’s nuclear units, including five (5) scheduled refueling outages and one (1) forced outage. ORS reviewed the outages, including information and data provided by the Company, associated NRC documents, and discussed the outages with Company management. ORS found the outages to be reasonable.

Additionally, ORS reviewed the Oconee Unit 1 reactor coolant pump seal leakage forced outage that occurred between November 30, 2018 and December 8, 2018. The Company’s investigation was not completed in time to be included in ORS’s previous Annual Fuel Review testimony. ORS found this outage to be reasonable.

Q. WHAT WERE THE RESULTS OF ORS’S ANALYSIS OF THE COMPANY’S POWER PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. ORS’s review of the Company’s operation of its generation facilities during the Actual Period revealed that the Company made reasonable efforts to maximize unit availability and minimize fuel costs.

Q. DID ORS REVIEW THE COMPANY'S GENERATION MIX DURING THE ACTUAL PERIOD?

A. Yes. Exhibit BSB-5 shows the generation mix for the Actual Period by percentage and generation type. As shown in this exhibit, the nuclear, coal, and natural gas plants contributed an average of 56.25%, 16.55%, and 15.81%, respectively, of the Company's generation throughout the Actual Period. This equates to approximately 88.61% of the Company's generation for the Actual Period. The remainder of the generation was met through a mix of hydroelectric, renewables, purchased power, and Joint Dispatch Agreement purchases.

Q. DID ORS REVIEW THE COMPANY'S FUEL COSTS ON A PLANT-BY-PLANT BASIS FOR THE ACTUAL PERIOD?

A. Yes. Exhibit BSB-6 shows the average fuel costs for the major generation plants on the Company's system for the Actual Period and the megawatt-hours ("MWh") produced by those plants. The chart shows the lowest average fuel cost of 0.590 cents/kilowatt-hour ("kWh") at Oconee Nuclear Station and the highest average fuel cost of 3.531 cents/kWh at the Marshall Steam Station. The Company utilizes economic dispatch, which generally requires the lower cost units to be dispatched first.

Q. DID ORS REVIEW THE COMPANY'S FORECASTED POWER PLANT OPERATIONS FOR THE ESTIMATED AND FORECASTED PERIODS?

A. Yes. ORS reviewed the Company's maintenance schedules and projected performance data for its power plants for the Estimated and Forecasted Periods. ORS compared these schedules to previous maintenance schedules from Docket No. 2019-3-E and found them to be reasonable.

1 **Q. WILL YOU UPDATE YOUR DIRECT TESTIMONY BASED ON INFORMATION**
2 **THAT BECOMES AVAILABLE?**

3 **A.** Yes. ORS fully reserves the right to revise its recommendations via supplemental
4 testimony should new information not previously provided by the Company, or other
5 sources, becomes available.

6 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

7 **A.** Yes, it does.

Office of Regulatory Staff
Power Plant Performance Data
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-1

Coal Plants	Unit	MW Rating	<i>Actual Period Data</i>		
			Average Availability Factor (%)	Average Net Capacity Factor (%)	Average Forced Outage Factor (%)
Belews Creek ³	1	1,110	48.33	20.09	0.09
Belews Creek	2	1,110	85.55	38.84	1.82
Cliffside ²	5	544	78.44	30.52	3.31
Cliffside ²	6	844	86.55	60.38	6.07
Marshall	1	370	72.62	16.82	0.79
Marshall	2	370	90.09	27.12	2.71
Marshall	3	658	69.28	39.40	12.80
Marshall	4	660	89.95	59.62	3.67
Coal Totals		5,666	79.38	32.93	3.15
<i>NERC 5-year average (All Coal Plants)</i>			<i>83.00</i>	<i>54.69</i>	<i>5.09</i>

CC Plants ¹	Unit	MW Rating	Average Availability Factor (%)	Average Net Capacity Factor (%)	Average Forced Outage Factor (%)
Buck	10	668	97.09	75.00	0.43
Dan River	7	662	83.36	66.34	0.42
WS Lee	10	786	88.10	83.13	0.41
CC Totals		2,116	89.48	75.14	0.42
<i>NERC 5-year average (CC Plants)</i>			<i>87.91</i>	<i>53.59</i>	<i>2.34</i>

Nuclear Plants	Unit	MW Rating	Average Availability Factor (%)	Average Net Capacity Factor (%)	Average Forced Outage Factor (%)
Catawba	1	1,160	90.91	91.06	0.94
Catawba	2	1,150	93.16	92.72	0.00
McGuire	1	1,158	90.91	91.06	0.00
McGuire	2	1,158	93.16	92.72	0.00
Oconee	1	847	100.00	101.32	0.00
Oconee	2	848	90.89	91.85	0.00
Oconee	3	859	92.09	92.27	0.00
Nuclear Totals		7,180	94.38	95.10	0.13
<i>NERC 5-year average (All Nuclear Plants)</i>			<i>92.40</i>	<i>91.38</i>	<i>1.48</i>

¹ CC designates Combined-Cycle units.² Cliffside Units 5 and 6 began Dual Fuel Operations in November and December of 2018.³ Belews Creek Unit 1 began Dual Fuel Operations in January 2020.

Office of Regulatory Staff
Coal Unit Outages - 7 Days or Greater Duration
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-2
Page 1 of 2

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Belews Creek 1	9/7/19	12/29/19	2,733.38	Planned	Unit taken offline for a planned Fall outage.
Belews Creek 1	1/12/20	2/16/20	834.70	Maintenance	Unit taken offline to repair high pressure and low pressure generator hydrogen cooler leak.
Belews Creek 1	3/2/20	3/13/20	252.63	Planned	Unit taken offline for a planned Spring outage.
Belews Creek 1	5/4/20	5/20/20	394.08	Planned	Unit taken offline for a planned Spring outage.
Belews Creek 2	10/5/19	11/3/19	705.15	Planned	Unit taken offline for a planned Fall outage.
Belews Creek 2	11/22/19	11/29/19	176.68	Maintenance	Unit taken offline to repair booster fan.
Belews Creek 2	12/2/19	12/9/19	184.00	Maintenance	Unit taken offline to repair 2-BU-200-2 startup valve.
Cliffside 5	9/22/19	10/13/19	508.77	Planned	Unit taken offline for a planned Fall outage.
Cliffside 5	12/13/19	12/28/19	350.10	Maintenance	Unit taken offline to replace F4C coal feeder.
Cliffside 5	3/7/20	3/30/20	573.48	Planned	Unit taken offline for a planned Spring outage.
Cliffside 6	9/7/19	10/1/19	591.92	Planned	Unit taken offline for a planned Fall outage.

Office of Regulatory Staff
Coal Unit Outages - 7 Days or Greater Duration
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-2
Page 2 of 2

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Cliffside 6	12/7/19	12/16/19	226.43	Forced	Unit forced offline due to auxiliary transformer.
Marshall 1	6/5/19	6/15/19	241.50	Maintenance	Unit forced offline due to mist eliminator failure.
Marshall 1	8/30/19	11/22/19	2001.15	Planned	Unit taken offline for a planned Fall outage.
Marshall 2	6/5/19	6/15/19	238.32	Forced	Unit forced offline due to mist eliminator failure.
Marshall 2	10/29/19	11/20/19	542.13	Planned	Unit taken offline for a planned Fall outage.
Marshall 3	10/4/19	10/28/19	576.48	Maintenance	Unit taken offline for bottom ash hopper clinker removal.
Marshall 3	2/28/20	5/17/20	1043.35	Planned	Unit taken offline for a planned Spring outage.
Marshall 4	5/11/20	5/21/20	245.00	Maintenance	Unit taken offline for maintenance on air heater fouling.

Office of Regulatory Staff
Natural Gas Unit Outages - 7 Days or Greater Duration
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-3

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Dan River	10/18/19	12/3/19	1,088.43	Planned	Unit taken offline for a planned Fall outage.
Dan River	4/17/20	4/27/20	233.97	Planned	Unit taken offline for a planned Spring outage.
WS Lee	10/11/19	11/23/19	1,010.98	Planned	Unit taken offline for a planned Fall outage.

Office of Regulatory Staff
Nuclear Unit Outages
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-4

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Catawba 2	9/14/19	10/9/19	598.48	Planned	Unit taken offline for a scheduled refueling outage.
Oconee 2	11/8/19	12/12/19	798.52	Planned	Unit taken offline for a scheduled refueling outage.
Catawba 1	2/12/20	2/16/20	82.15	Forced	Unit forced offline due to a loss of generator field.
McGuire 2	3/21/20	4/13/20	562.25	Planned	Unit taken offline for a scheduled refueling outage.
Oconee 3	4/10/20	5/9/20	695.18	Planned	Unit taken offline for a scheduled refueling outage.
Catawba 1	5/2/20	6/1/20	724.57	Planned	Unit taken offline for a scheduled refueling outage.

Office of Regulatory Staff
Generation Mix (Percentage)
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-5

	2019						2020					
	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Nuclear	55.35	49.80	50.57	48.09	60.37	55.78	57.50	57.43	58.29	61.84	62.56	57.43
Coal	20.84	27.63	27.55	23.24	14.39	24.32	13.35	12.48	7.03	8.36	10.27	9.12
Natural Gas	15.04	15.42	15.49	16.77	13.03	8.60	15.49	17.93	19.69	20.86	13.69	17.69
Hydroelectric	1.80	0.59	0.41	-0.03	0.51	0.90	1.89	2.72	3.35	2.44	2.71	3.62
Solar	0.15	0.14	0.14	0.15	0.13	0.11	0.10	0.09	0.10	0.13	0.22	0.19
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purchased Power	3.20	3.08	3.28	4.56	4.41	4.38	4.16	3.41	3.94	3.79	4.02	4.07
JDA Purchases	3.62	3.33	2.55	7.21	7.15	5.92	7.50	4.93	7.60	2.59	6.53	7.89

Numbers may not equal 100% due to rounding.

Office of Regulatory Staff
Generation Statistics for Major Plants
Duke Energy Carolinas, LLC
Docket No. 2020-3-E

EXHIBIT BSB-6

Plant	Fuel Type	Average Fuel Cost (¢/kWh)¹	Generation (MWh)
Oconee	Nuclear	0.590	21,341,975
McGuire	Nuclear	0.593	19,992,749
Catawba	Nuclear	0.598	18,645,056
WS Lee CC	Natural Gas	2.138	5,863,432
Dan River CC	Natural Gas	2.201	4,183,811
Buck CC	Natural Gas	2.211	4,769,824
Cliffside ²	Coal/Natural Gas	3.214	5,966,851
Belews Creek ³	Coal/Natural Gas	3.301	5,745,975
Marshall	Coal	3.531	7,199,976

¹ Includes Base Fuel and Environmental Costs.

² Cliffside Units 5 and 6 began Dual Fuel Operations in November and December of 2018.

³ Belews Creek Unit 1 began Dual Fuel Operations in January 2020.